UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, WA 98101

March 16, 2011

Reply to
Attn Of: OEA-095

MEMORANDUM

SUBJECT: Risk Evaluation of Activity-Based Sampling Results
Former Vermiculite Northwest Exfoliation Plant and Surrounding Residential Properties
Spokane, Washington

FROM: Julie Wroble
Region 10 Toxicologist

TO: Greg Weigel
On-Scene Coordinator

In 2009, EPA completed sampling and analysis activities for on-site locations and off-site residential properties located at and near the former Vermiculite Northwest Exfoliation Plant in Spokane, Washington (EPA 2010). The results of this sampling have demonstrated that even when soils containing trace or low levels of Libby Amphibole are disturbed, the resulting concentrations of asbestos in air do not exceed levels that pose a risk to human health, based on conservative assumptions about exposure.

Last fall, EPA prepared screening levels to ensure that analytical sensitivities were adequate to "see" if there was a problem posed by asbestos levels in air resulting from activity-based sampling. These screening levels were developed by assuming a cancer risk level of 1E-04 (or one in 10 thousand), which is a common threshold for taking action at asbestos sites nationally. Further, the screening levels assumed routine, regular contact with soil in residential yards (see EPA 2009 for more details).

A summary of the screening levels determined for the site and nearby residential properties are included in the table below:

Receptor	Exposure Duration (years)	Age-adjusted Unit Risk (per s/cc)	Screening Level (PCM s/cc)
Child Resident who plays outside	15	0.11 (15 year exposure begins at age 2)	0.015
Adult Resident (who lived there as a child) that gardens	15	0.058 (15 year exposure begins at age 17)	0.03
Combined Child and Adult from above			0.01
Adult Resident that gardens	30	0.06 (30 year exposure begins at age 25)	0.036
Worker (1 hour/day contact)	25	0.056 (25 year exposure begins at age 25)	0.062
Worker (8 hour/day contact)	1	0.0041 (1-year exposure begins at age 25)	0.1

The results of activity-based and stationary air sampling are presented in EPA 2010. Briefly, for activity-based sampling, concentrations ranged from not detected up to 0.0025 phase contrast microscopy equivalent (PCME) s/cc. None of these samples exhibited concentrations exceeding the risk-based screening levels identified above. The stationary air concentrations were all non-detect for PCME fibers except for two samples with concentrations of 0.0006 s/cc and 0.0012 s/cc. These levels are not expected to be associated with excess lifetime cancer risks greater than 1E-04.

In addition, EPA went back to activity-based sampling data that was gathered in 2002 on the main portion of the facility. At that time, more aggressive activity-based sampling was performed to assess the impact of future construction and redevelopment activities that might occur at the site. For example, a backhoe was used to dig up soils and these were further disturbed using a leaf blower to dry and disperse the soils. Libby Amphibole asbestos (predominantly actinolite and winchite) was detected in these samples.

The initial risk analysis done in 2002 assumed that workers on site were exposed throughout the work day for a long-term exposure period (e.g., 25 years, see EPA 2003). This information was used to advise the county that vermiculite contamination was present and precautions were warranted for any site use and redevelopment. The current risk analysis answers the question of whether intermittent activities over a long period of time, or intense activities over a short period of time pose a risk to workers on site. The concentrations detected in the 2002 ABS event were higher (ND – 0.045 f/cc by TEM) than in the 2009 sampling event (ND – 0.0025 f/cc by TEM). The 2002 ABS concentrations likely were higher because the main portions of the site contained more vermiculite and hence more Libby Amphibole asbestos and also the activities conducted in 2002 were more aggressive than those conducted in 2009.

For both data sets, detected concentrations do not exceed screening levels associated with either intermittent long-term worker activities or more intense, short-term worker activities on-site.

As a result of this sampling and comparison to calculated risk-based screening levels, EPA does not anticipate doing additional removal or sampling at or near the former Vermiculite Northwest Exfoliation Plant (with the exception of a small, garden bed area, as discussed below), unless new information indicates this is necessary.

Additional Findings:
At one property south of site PLM results indicated 0.25% asbestos in soils collected from a garden bed. ABS was not done at this property, but a series of samples were processed using the fluidized bed, an experimental device used to determine the amount of asbestos fibers in the fine fraction of soil. The fluidized bed samples were analyzed by TEM and found to contain elevated concentrations of asbestos relative to other locations around the site. Although the fluidized bed device is still in the developmental stage and full validation has not yet been completed, EPA believes that this information is sufficiently compelling to warrant replacement of the fill material in the garden bed as a conservative measure to address potential risk.

Initial site investigation work and interviews that were conducted in 2000 had indicated that stoner rock (unexfoliated vermiculite) was likely present on a property of a former manager of the Vermiculite Norwest facility, in Chatteroy, north of Spokane. EPA visited the property in the fall of 2010. Recently, the owner brought fill material was brought into the property. EPA looked for any evidence of vermiculite on the property and did not find any, even under the recently placed fill. Therefore, sampling activities are not warranted at this property.

Finally, EPA has heard reports that Spokane County would like to redevelop the property where the former exfoliation facility is located. Because much of EPA's work was focused on surface soil (except some limited subsurface investigation completed in 2002), future development of the site would require practices consistent with handling asbestos containing materials (ACMs). For example, excavation of subsurface soils for new construction likely would require dust control measures and worker health and safety requirements specific to sites with asbestos. Further, institutional controls may be needed to ensure that appropriate controls are in place for any future soil disturbing activities.

Please contact me at 206/553-1079 if you have additional questions about this technical memorandum.

References:

EPA, May 2010, Environmental Monitoring for Asbestos, Vermiculite Northwest Exfoliation Plant and Surrounding Residential Properties, Spokane, Washington, prepared by Jed Januch, Senior Investigator, Office of Environmental Assessment.

EPA, September 2009, Vermiculite Northwest Screening Levels for Activity-Based Sampling, prepared by Julie Wroble, Region 10 Toxicologist, Office of Environmental Assessment.

EPA, March 2003, Study of Asbestos Contamination of Former Vermiculite Northwest/W. R. Grace Vermiculite Exfoliation Facility, prepared by Region 10, Office of Environmental Assessment, Investigation and Engineering Unit.

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MEMORANDUM

SUBJECT: Vermiculite Northwest Screening Levels for Activity-Based Sampling

FROM: Julie Wroble
Region 10 Toxicologist

TO: Greg Weigel
On-Scene Coordinator

The purpose of this technical memorandum is to present the screening levels for the Vermiculite Northwest site in Spokane, Washington. The main objectives of EPA's current sampling is to determine whether residual vermiculite and associated asbestos present in site soils and on residential properties adjacent to the site pose a threat to human health. Note that the anticipated future use of this site is expected to continue as a mixed-use, industrial facility. This field investigation will be conducted by EPA.

Attachment 1 presents screening levels that could be used for activity-based sampling (ABS) conducted at the site and neighboring properties. If the ABS results are less than the screening levels, then no further action may be warranted at this time. If the clearance levels are exceeded, then some type of mitigation or remediation of the affected areas may be warranted.

ATTACHMENT 1

CALCULATION OF SCREENING LEVELS FOR ASBESTOS FIBERS IN AIR

1.0 Basic Equations

Risk from inhalation exposure to asbestos fibers may be calculated using the following the basic equation:

$$Risk = C * UR * TWF$$

Where:

C = Concentration of fibers in air (s/cc)
UR = Unit Risk (risk per s/cc)
TWF = time-weighting factor (fraction of lifetime during which exposure occurs)

The target screening levels can be calculated by revising the equation as follows:

$$SL = TR / (UR * TWF)$$

Where:

TR = Target cancer risk level

For the resident, assuming that part of the time (e.g., 15 years) is spent as a child and another 15 years is spent as an adult, a combined screening level is calculated as follows:

$$SL = TR / [(URc * TWFc) + (URa * TWFa)]$$

Where:

URc = Age-adjusted unit risk for the child
TWFc = Time-weighting factor for the child
URa = Age-adjusted unit risk for the adult
TWFa = Time-weighting factor for the adult

2.0 Calculation of Screening Levels

Each of the three input parameters needed to calculate the target Screening Level is discussed below, along with the resulting values.

Target Risk Level

The target risk level is a risk management judgment, and may depend on a number of factors. For the purposes of these calculations, the Target Risk was assumed to be 1E-04 (i.e., one in ten thousand), which is the upper bound on EPA's risk range as defined in the National Contingency Plan. This risk level is consistent with the risk level used as the decision point at other asbestos sites, specifically World Trade Center (Contaminants of Potential Concern Committee of the World Trade Center Indoor Air Task Force Working Group, 2003). Further, asbestos analysis to a lower risk level is challenging because a larger volume of air would need to be collected or more grids counted. These factors would dramatically increase the cost of doing the required TEM analysis of the ABS samples.

Unit Risk

IRIS (2003) identifies a unit risk of 0.23 per PCM fiber per ml. This unit risk value reflects exposures that begin at birth and last for a lifetime. However, recent EPA guidance suggests that age-adjusted unit risk factors may be appropriate for asbestos because exposures that occur early in life may present a greater threat to exposed individuals than exposures that occur later (EPA 2008). This is an important consideration for the residential properties being investigated near the Northwest Vermiculite site. Workers, who may not be exposed to asbestos until they are adults, may have a lower potential for health effects from asbestos exposure. The unit risk values selected can account for differences in duration of exposure and when exposure begins. For further details, see Appendix E of the Framework for Investigating Asbestos-Contaminated Superfund Sites (http://www.epa.gov/superfund/health/contaminants/asbestos/pdfs/framework_asbestos_guidance.pdf).

Time-Weighting Factor

The TWF is the fraction of full time that exposure occurs. This depends on the assumed time and frequency of exposure. Because activity-based sampling is done to determine what exposures could be during activities when soil is disturbed, the time-weighting factor should reflect those outdoor activities that involve soil disturbance. Even minimal soil disturbance, such as walking on a path, can result in asbestos fibers being released from the soil to the breathing zone.

Activity	Exposure Time (hr/day)	Exposure Frequency (d/year)	TWF
Total	24	365	1.00
Playing Outdoors (Child Ages 2-17)	2	270	0.062
Gardening (Adult Ages 17 – 32)	10	50	0.057
Gardening (Adult Ages 25-55)	10	50	0.057
Intermittant Worker (Adult Ages 25-50)	1	250	0.028
Intense Worker (Adult Ages 25-26)	8	250	0.23

Note that these assumptions were selected to represent a conservative estimate of the actual exposure associated with each scenario. However, it is assumed that no other exposures to asbestos occur (e.g., no exposures to material tracked indoors, if that occurs). In order to select the appropriate age-adjusted unit risk value, the duration of exposure also must be specified and is presented in the table below for each receptor category.

Playing in the Dirt: Exposure Factors Handbook, Table 15-58, the 90th percentile value of 120 minutes/d for children ages 1-17 was used for the exposure time. Best professional judgment about snow cover and cold conditions at the site was used to arrive at 270 days/year. The entire span of the age group (i.e., 15 years) was used for exposure duration.

Gardening: This scenario is based on the 95th percentile value for hours per month that adults garden as provided in the Exposure Factors Handbook, Table 15-62. The standard EPA

reasonable maximum exposure (RME) residential exposure duration of 30 years was assumed. Note that one adult receptor below was assumed to spend the first 15 years of their life exposed as a child, while the other one receives all of their exposure as an adult. You can see the the combined child and adult screening level is lower than either the child or adult alone.

Briefly, the exposure factors for exposure frequency and exposure duration for the intermittant worker were taken from *Guidance for Conduct of Deterministic Human Health Risk Assessments* (ODEQ 1998). The exposure time outdoors was assumed to be 1 hour/day, based on best professional judgment. The standard RME exposure duration for workers of 25 years was assumed. For the intense worker scenario (e.g., for construction activities), the exposure time outdoors was assumed to be 8 hours/day and the exposure duration was assumed to be 1 year based on best professional judgment.

Results

Based on these inputs, the target screening levels are as follows:

Receptor	Exposure Duratio (years)	Age-adjusted Unit Risk (per s/cc)	Screening Level (PCM s/cc)
Child Resident who plays outside	15	0.11 (15 year exposure begins at age 2)	0.015
Adult Resident (who lived there as a child) that gardens	15	0.058 (15 year exposure begins at age 17)	0.03
Combined Child and Adult			0.01
Adult Resident that gardens	30	0.06 (30 year exposure begins at age 25)	0.036
Intermittant Worker (1 hour/day contact)	25	0.05 (25 year exposure begins at age 25)	0.07
Intense Worker (8 hours/day contact)	1	0.0041 (1 year exposure begins at age 25)	0.1

Based on the above, an analytical sensitivity of 0.001 f/cc should be adequate to determine whether risks will be acceptable or not for workers currently on site. Note that the analytical sensitivity above also should be specific for PCME fibers. For residential properties, the screening level of 0.01 PCM s/cc would be protective of adults and children who may live near the site. For the site, the screening level of 0.07 PCM s/cc would be protective of daily exposures (not exceeding one hour) to outdoor soils contaminated with vermiculite

If the activity-based sampling results exceed the screening levels, then the OSC shall decide whether to proceed to a remedial action at the affected property or whether additional sampling may be warranted. Similarly, these results can potentially be extrapolated to nearby properties that may not have been sampled using activity-based sampling.

Uncertainties

The screening levels calculated above are intended to be used by the OSC and EPA Region 10 risk managers. Actual risks posed to people that work on or live near the Vermiculite Northwest Site could be higher or lower than what is indicated by our sampling data. A variety of factors including frequency of exposure and sources of

contamination may influence the extent to which individuals may be exposed to asbestos from the former vermiculite site.

References:

Contaminants of Potential Concern Committee of the World Trade Center Indoor Air Task Force Working Group. (2003). World Trade Center Indoor Environment Assessment: Selecting Contaminants of Potential Concern and Setting Health-Based Benchmarks. New York, NY.

Oregon Department of Environmental Quality, December 1998 (updated May 2000), Guidance for Conduct of Deterministic Human Health Risk Assessments, Waste Management and Cleanup Division, Cleanup Policy and Program Development Section, Portland, Oregon, http://www.deq.state.or.us/wmc/documents/hh-guide.pdf.

United State Environmental Protection Agency (EPA), 1988, Integrated Risk Information System, Health Assessment Information for Asbestos, http://www.epa.gov/iris/subst/0371.htm.

EPA, September 2008, Framework for Investigating Asbestos contaminated Superfund Sites, OSWER Directive No. 9200.0-68, Prepared by the Asbestos Committee of the Technical Review Workgroup of the Office of Solid Waste and Emergency Response, http://www.epa.gov/superfund/health/contaminants/asbestos/pdfs/framework_asbestos_guidance.pdf.